

Remarks

In view of the following amendments and remarks, favorable reconsideration of the outstanding office action is respectfully requested. Claims 1 – 55 remain in this application. Claims 4 – 8 have been amended.

**1. Allowed Claims/Subject Matter**

Applicant notes with appreciation that the Examiner has indicated the subject matter of claims 15 – 23, 26 – 30, 39, 40, 44, and 46 – 55 are patentable, and would be allowable if rewritten in independent form.

**2. Claim Objections**

The Examiner has objected to claims 4 – 10 under 35 U.S.C. § 112, second paragraph, as being indefinite for lack of antecedent basis. In particular, the Examiner asserts that the phrase “said steps in load current” in claims 4, 5, and 7, and the phrase “said steps in line voltage,” in claim 8, lack antecedent basis. The Applicants found a similar informality in claim 6. Accordingly, the Applicants have amended claims 4 – 8 in response to the Examiner’s Claim Objections.

**3. § 102 Rejections**

A. The Examiner has rejected claim 1 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,325,098 to Heller.

Claim 1 is directed to an arc fault detector for a power line system. The detector includes an upstream/downstream discriminator circuit. The discriminator circuit detects current fluctuations in at least one current characteristic of a load current and voltage fluctuations in at least one voltage characteristic of a line voltage. The discriminator circuit detects an upstream transient event when the current fluctuations and the voltage fluctuations are in phase. The discriminator circuit detects a downstream transient event when said current fluctuations and said voltage fluctuations are out of phase.

Heller is directed to a system for detecting the position of a fault on an electric link. Referring to Figure 4, the system includes a directional relays  $D_1$  and  $D_2$  that are placed at each end of a line (L) to provide a directional indication. The protective relay  $D_1$  is connected

to monitor the line (L) in the direction indicated by the pointer (flag), which is referred to as the forward direction. The backward direction corresponds to that part of the electric link located outside line (L). The forward and backward direction of relay D<sub>2</sub> is determined in the same fashion. Col. 2, line 58 – Col. 3, line 15.

Protection unit D<sub>1</sub> sends to protection unit D<sub>2</sub> a blocking signal when it “sees” a fault in the backward direction; when it sees the fault in the forward direction, it provides no signal. Col. 3, lines 39 – 42.

The “working principle of directional relays is based on the local phase comparison of voltage and current magnitudes measured at one point on the line. It is the result of this comparison which provides the forward/backward indication eventually transmitted to the other end of the line.” Col. 3, lines 62 – 67.

“The phase of a voltage existing at the measurement point before the fault occurs (*memorized voltage*) is compared with the phase of the current measured at the measurement point where the relay is located after the fault occurs. This phase comparison is conveniently expressed in terms of the ratio of complex quantities representing the voltage and the current in question. When this ratio is positive, it indicates a phase concordance between the terms of the ratio, which corresponds to a fault forward of the measurement point. In the opposite case (negative ratio, phase discordance) the fault is in the backward direction.” Col. 4, lines 1 – 13.

According to **MPEP 2131**, “to anticipate a claim, the reference must teach every element of the claim.” A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The Applicants respectfully point out that the Examiner has failed to make a prima facie case of anticipation because he does not point out where the cited art discloses each and every element as set forth in claim 1.

Claim 1 is directed to an arc fault detector. The Examiner does not point out where Heller teaches or discloses detecting arc faults. Col 1, lines 40 – 45 identifies faults as being due to “short circuits.” An electronic search of the patent document reveals that the term “arc fault” is not present in the cited art. Second, the Examiner does not point out where Heller teaches or discloses an upstream/downstream discriminator circuit disposed within an arc fault detector.

The Examiner asserts that Heller discloses such a circuit in Col. 3, lines 62 – 67. As noted above, the cited text states that the “working principle of directional relays is based on the local phase comparison of voltage and current magnitudes measured at one point on the line. It is the result of this comparison which provides the forward/backward indication.” The Applicants also note that the text cited by the Examiner does not teach, suggest, or disclose comparing current fluctuations in at least one current characteristic of *a load current* and voltage fluctuations in at least one voltage characteristic of *a line voltage*. In contrast, Heller teaches a relay that compares voltage and current magnitudes at the same point on a line. The system also requires two relays to be employed at either end of the line to localize a fault condition rather than one device as recited in claim 1.

Heller goes onto say in Col. 4, lines 9 – 13, the text cited by the Examiner, that “the phase of a voltage existing at the measurement point *before the fault occurs* (memorized voltage) is compared with the phase of the current measured at the measurement point where the relay is located *after the fault occurs*.” Accordingly, the measurements of the phases of the voltage and the current amplitudes are taken separately and at different moments in time. For example, the voltage measurement is taken first and stored for later use.

On the other hand, claim 1 measures and compares fluctuations in the load current with fluctuations in the line voltage in order to detect the presence of a transient. Thus, the Examiner does not point out where Heller discloses a “discriminator circuit that detects current fluctuations in at least one current characteristic of a load current and voltage fluctuations in at least one voltage characteristic of a line voltage,” as recited in claim 1. Neither does the Examiner point out where Heller teaches or discloses a circuit that detects “an upstream transient event when the current fluctuations and the voltage fluctuations are in phase,” or a circuit that detects “a downstream transient event when said current fluctuations and said voltage fluctuations are out of phase.”

The Examiner has not made a prima facie case of anticipation because the Examiner has not shown where Heller discloses each and every element of claim 1. Accordingly, claim 1 is patentable under 35 U.S.C. § 102(b). The Applicants respectfully request that the rejection of claim 1 under 35 U.S.C. § 102(b) be withdrawn.

B. The Examiner has rejected claim 1 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,796,259 to Dickmander.

Claim 11 is directed to an arc fault protection device, protective of a branch circuit portion of a power line electrical distribution system and connected to a load. The device includes a first sensor for detecting current fluctuations in at least one current characteristic of load current. The device also includes a second sensor for detecting voltage fluctuations in at least one voltage characteristic of a line voltage. A discriminator compares the polarities of the voltage fluctuations and the current fluctuations. The comparison indicates whether an arc fault or arc mimicking noise is located in the branch circuit portion or located in a remainder of the electrical distribution system based on the comparison of the polarities.

Claim 41 is directed to an arc fault protection device, protective of a branch circuit portion of an electrical distribution system and connected to a load. The device includes means for detecting current fluctuations in at least one current characteristic of load Current. The device further includes means for detecting voltage fluctuations in at least one voltage characteristic of a line voltage. Means are included for comparing the polarities of the voltage fluctuations and the current fluctuations. The comparison indicates whether an arc fault or arc mimicking noise is located in the branch circuit portion or located in a remainder of the electrical distribution system based on the comparison of the polarities.

Claim 42 is directed to a method for protecting a branch circuit portion of an electrical distribution system from an arc fault, the branch circuit portion being connected to a load. The method includes: detecting current fluctuations in at least one current characteristic of load current; detecting voltage fluctuations in at least one voltage characteristic of a line voltage; and comparing the polarities of the voltage fluctuations and the current fluctuations. The comparison indicates whether an arc fault or arc mimicking noise is located in the branch circuit portion or located in a remainder of the electrical distribution system based on the comparison of the polarities.

Dickmader discloses a method and apparatus that includes a voltage sampler for generating samples of the line voltage and a current sampler that generates samples of the line current. A first comparator compares the current samples from the previous power cycle to the current samples from the present cycle and determines the sign of the difference between the current samples. A second comparator compares the sign of the voltage from the previous cycle to the current sign determined by the first comparator and provides an indication of fault direction in relation to such comparison. The apparatus also includes a fault inception determiner, for providing a fault inception indication in relation to the voltage samples from

the previous and present cycles. The fault inception determiner is a comparator which compares the voltage samples from the previous cycle to the voltage samples from the present cycle and determines the sign of the difference between the samples. A synchronizer, such as a phase locked loop, must be used to synchronize the generation of the voltage and current samples at approximately the same points during each system cycle.

The Applicants respectfully point out that the Examiner has failed to make a *prima facie* case of anticipation because he does not point out where the cited art discloses each and every element set forth in claims 11, 41, and 42.

The Examiner asserts that independent claims 11, 41, and 42 are anticipated by col. 2, lines 60 – 67 and col. 3, lines 5 – 15. In particular, the Examiner does not show that Dickmader discloses a sensor for detecting either line voltage fluctuations or load current fluctuations, or a discriminator that compares the polarities of line voltage fluctuations with load current fluctuations. Dickmader does not teach voltage fluctuation, only the existence of an AC voltage having a positive polarity and a negative polarity. Thus, the Examiner has not pointed out where Dickmader discloses the claimed invention.

The Examiner has not made a *prima facie* case of anticipation because the Examiner has not shown where Dickmader discloses each and every element of claims 11, 41, and 42. Dependent claims 12 – 13, 24, 25, 31, 32, and 34 – 37 are allowable in their own right. For example, with regard to claim 13, the Examiner erroneously asserts that Dickmader discloses the detection of arc faults. However, an electronic search of the document reveals that the term “arc fault” is not mentioned a single time anywhere in Dickmader. Accordingly, claims 11, 12 – 13, 24, 25, 31, 32, 34 – 37, 41, and 42 are patentable under 35 U.S.C. § 102(b). The Applicants respectfully request that the rejection of claims 11, 12 – 13, 24, 25, 31, 32, 34 – 37, 41, and 42 under 35 U.S.C. § 102(b) be withdrawn.

#### 4. § 103 Rejections

A. The Examiner has rejected claims 2 and 3 under 35 U.S.C. § 103 as being unpatentable for obviousness over Heller in view of U.S. Patent No. 5,434,509 to Blades.

According to the **MPEP 2143**, three basic criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a

reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

In this case, claim 2 and claim 3 depend from claim 1. The Applicants have demonstrated that the Examiner did not show where Heller discloses each and every element of claim 1. The Examiner fails to point out where Blades discloses the elements missing from Heller. Accordingly, the Examiner has not made a prima facie case of obvious with regard to claim 2 and claim 3 under one of the legs of the obviousness test provided above.

Further, there is no motivation to combine the references because the proposed combination of the prior art would change the principle of operation of the prior art invention being modified, and therefore, the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). In this case, Blades teaches a single device interposed between a line and a load, whereas Heller teaches two relays disposed at either end of a line being monitored. Heller's relays monitor the current and voltage amplitudes, not high frequency phenomena. Thus, one skilled in the art would not be motivated to combine Blades with Heller because it would change the principle of operation of Heller.

B. The Examiner has rejected claim 14 under 35 U.S.C. § 103 as being unpatentable for obviousness over Dickmander in view of U.S. Patent No. 5,572,138 to Nimmersj"o.

Again, Applicants have demonstrated that the Examiner failed to show where Dickmander discloses each and every element of claim 11. The Examiner does not point out where Nimmersj"o discloses the elements missing from Dickmander. Accordingly, the Examiner has not made a prima facie case of obvious with regard to claim 14.

The Examiner does not provide any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. The Examiner is required to provide a suggestion based on information in the reference or in some body of knowledge known to those skilled in the art.

C. The Examiner has rejected claims 33, 38, 43, and 45 under 35 U.S.C. § 103 as being unpatentable for obviousness over Dickmander in view of Blades. The Applicants have shown that the Examiner did not show where Dickmander discloses each and every element of claims 11, 41, and 42. The Examiner fails to point out where Blades discloses the elements missing from Dickmander. Accordingly, the Examiner has not made a prima facie case of obvious with regard to claims 33, 38, 43, and 45.

The Examiner does not provide any suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. In his discussion, the Examiner refers to a reference "Russell et al." in his reasons for combining. Since the Russell reference is not being relied on by the Examiner, the Examiner's rationale does not appear to be relevant.

Accordingly, claims 2, 3, 14, 33, 38, 43, and 45 are patentable under 35 U.S.C. § 103 (a). The Applicants respectfully request that the rejection of claims 2, 3, 14, 33, 38, 43, and 45 under 35 U.S.C. § 103(a) be withdrawn.

**5. Conclusion**

Based upon the amendments, remarks, and papers of record, Applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests reconsideration of the pending claims 1 – 55 and a prompt Notice of Allowance thereon.

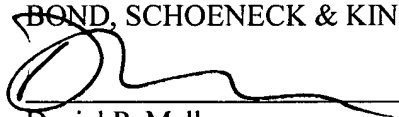
Applicant believes that no extension of time is necessary to make this Response timely. Should Applicant be in error, Applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Response timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 50-1546.

Please direct any questions or comments to Daniel P. Malley at (607) 330-4010.

Respectfully submitted,

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